

REMARKS

Claims 1-30 are pending in this application. By this Amendment, claim 30 has been added. Support for new claim 30 can be found on pages 6 and 7 of the specification. Reconsideration in view of the above amendments and following remarks is respectfully requested.

Applicant gratefully acknowledges that the 35 U.S.C. §112, rejection has been withdrawn.

1. 35 U.S.C. §102(b)

Claims 1-3, 5, 7, 22-23, and 26-29 are rejected under 35 U.S.C. §102(b) as being anticipated by *Chen et al* (U.S. Patent No. 6,410,142, hereinafter referred to as "*Chen*"). The rejection is respectfully traversed.

Claim 1 recites a nanocomposite electrolyte membrane for a fuel cell, comprising a polymer having cation exchange groups; and silicate nanoparticles dispersed in the polymer, the silicate nanoparticles having a layered structure, and the silicate nanoparticles being intercalated with the polymer, or layers of the silicate nanoparticles being exfoliated.

The Office Action cites column 2, lines 14-21 as evidence that *Chen* discloses all the features of claim 1. However, *Chen* fails to disclose or suggest the combination of features of claim 1, specifically, a membrane, and a polymer having cation exchange groups. *Chen* discloses a syndiotactic polystyrene (sPS), or sPS in combination with a polymer or oligomer, which is compatible or partially compatible with sPS. Applicant submits that sPS does not have cation exchange groups.

Additionally, *Chen* discloses sPS nanocomposites, but fails to disclose or suggest a nanocomposite electrolyte membrane for a fuel cell, as recited in claim 1.

For at least the reasons set forth above, applicant respectfully submits that *Chen* fails to disclose or suggest all the features of claim 1.

Similarly, claim 26 recites a nanocomposite electrolyte membrane for a fuel cell consisting essentially of a polymer having cation exchange groups; silicate nanoparticles dispersed in the polymer; and cationic surfactant adsorbed within the silicate nanoparticles.

Applicant again respectfully submits that *Chen* fails to disclose or suggest a polymer having cation exchange groups or a nanocomposite electrolyte membrane for a fuel cell.

Finally, claim 29 recites a method of forming a nanocomposite electrolyte membrane, comprising mixing silicate nanoparticles with surfactant, water and a polymer having cation exchange groups; and drying the mixture to form a nanocomposite electrolyte membrane.

As mentioned above, Applicant respectfully submits that *Chen* fails to disclose or suggest the features mentioned above.

For at least the reasons set forth above, Applicant respectfully submits that claims 1, 26 and 29 are allowable. Claims 2, 3, 5, 7, and 22 depend from claim 1, and claims 27 and 28 depend from claim 26, and are allowable for at least the same reasons as claims 1 and 26, respectively. Withdrawal of the rejection is respectfully requested.

2. 35 U.S.C. §103(a)

a. *Chen* in view of *Blanton et al.*

Claim 4 is rejected under 35 U.S.C. §103(a) as being unpatentable over *Chen* in view of *Blanton et al.* (U.S. Patent No. 6,555,610, hereinafter referred to as "*Blanton*"). This rejection is respectfully traversed.

Applicant respectfully submits that *Chen* and *Blanton* are not combinable. *Chen* is directed specifically to sPS nanocomposites as evidenced throughout the specification of the *Chen* patent. *Chen* even goes as far as to specifically state that the object of the invention is to provide a sPS nanocomposite. The only other polymers mentioned in *Chen* are ones "which [are] compatible or partially compatible with sPS." See column 3, lines 18-20.

Blanton, on the other hand, discloses polyethylene oxide in combination with intercalated clay. Throughout *Blanton*, polyethylene oxide is emphasized and there is no disclosure or suggestion for a different polymer other than polyethylene oxide, let alone sPS.

Applicant therefore respectfully submits that one of ordinary skill in the art would not look to *Blanton* in order to revise the shortcomings of *Chen*. Additionally, *Blanton* does not cure the deficiencies of *Chen* in that in *Chen's* discussion in the background of the invention, *Chen* discloses many uses of sPS, but fails to disclose or suggest using a sPS nanocomposite for an electrolyte membrane, as recited in claim 4.

For at least the reasons set forth above, Applicant respectfully submits that claim 4, which depends from claim 1, is allowable for at least the same reasons as claim 1. Withdrawal of the rejection is respectfully requested.

b. *Chen* in view of *Grot et al.*

Claim 8 is rejected under 35 U.S.C. §103(a) as being unpatentable over *Chen* in view of *Grot et al.* (U.S. Patent No. 5,919,583, hereinafter referred to as "*Grot*"). This rejection is respectfully traversed.

As discussed above, applicant respectfully submits that claim 1 is allowable over *Chen* for at least the reasons mentioned above. Claim 8 depends from claim 1. Applicant respectfully submits that *Grot* is not combinable with *Chen*. As mentioned above, *Chen* is specifically directed to sPS, while on the other hand, *Grot* is directed to polymers having cation exchange groups. *Grot* discloses multiple polymers with cation exchange groups, and fails to disclose or suggest sPS or polymers that would be expected to be compatible with sPS. Applicant respectfully submits that the styrene groups within the sPS would not lead one of ordinary skill in the art to have a reasonable expectation of success in substituting *Grot*'s polymers and copolymers therein.

Also, the use of nanodispersed material provides unexpected results with sPS in particular. In column 2, lines 36-38, *Chen* states: "It has been found that the nanodispersed clay material unexpectedly increases the crystallization rate and crystallization temperature of sPS." Therefore, one of ordinary skill in the art might not expect such results if combined with any other reference, including *Grot*, and therefore combining *Grot* or any other reference with *Chen* would not lead to a high expectation of success.

For at least the reasons set forth above, Applicant respectfully submits that claim 8 is allowable. Withdrawal of the rejection is respectfully requested.

c. *Chen* in view of *Taft, III et al.*

Claims 6, 9, 10, 14-15, 17-19, 21, and 24-25 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Chen* in view of *Taft III et al.* (U.S. Patent No. 6,630,265, hereinafter referred to as "*Taft*"). This rejection is respectfully traversed.

As mentioned above, Applicant respectfully submits that claim 1, from which claims 6, 9, 10, 14, 15, 17-19, 21, 24, and 25 depend, is not disclosed or suggested by *Chen*. Applicant submits that *Taft* cannot be combined with *Chen*.

As also mentioned above, *Chen* specifically states that sPS or polymers or oligomers compatible or partially compatible with sPS are utilized therein. Further, *Chen* states that the sPS material provides unexpected results as mentioned above. Therefore, Applicant respectfully submits that the use of other polymers, such as those disclosed in *Taft*, would not have a high expectation of success, and therefore one of ordinary skill in the art would not look to *Taft* to modify the sPS nanocomposite of *Chen*.

For at least the reasons set forth above, Applicant respectfully submits that claim 1 is allowable. Claims 6, 9, 10, 14, 15, 17-19, 21, and 24-25 depend from claim 1, and are allowable for at least the same reasons. Withdrawal of the rejection is respectfully requested.

d. *Chen* in view of *Taft*, and *Yen et al.*

Claims 11-13 are rejected under 35 U.S.C. §103(a) as being unpatentable over *Chen* in view of *Taft*, and further in view of *Yen et al.* (U.S. Patent No. 5,795,496, hereinafter referred to as "*Yen*"). This rejection is respectfully traversed.

As mentioned above, Applicant respectfully submitted that *Chen* in view of *Taft* did not disclose or suggest all the features of claim 1, from which claims 11-13 depend. *Yen* does not cure the deficiencies of *Chen* and *Taft* and also is not combinable with at least *Chen*. Applicant submits that for the reasons discussed above concerning *Chen*, the polymers utilized in *Yen* would not be compatible. The polymers disclosed in *Yen* include a polyether ether ketone (PEEK) and the like, but do not disclose or suggest the use of sPS as disclosed in *Chen*.

For at least the reasons set forth above, Applicant respectfully submits that claims 11-13, which depend from claim 1, are allowable for at least the same reasons as claim 1. Withdrawal of the rejection is respectfully requested.

e. *Chen* in view of *Taft*, and *Blanton*

Claim 16 is rejected under 35 U.S.C. §103(a) as being unpatentable over *Chen* in view of *Taft*, and further in view of *Blanton*. This rejection is respectfully traversed.

Applicant respectfully submits that *Chen*, *Taft* and *Blanton* have been discussed above, and for at least the reasons discussed above, applicant respectfully submits that claim 16, which depends from claim 1, is allowable for at least the same reasons. Withdrawal of the rejection is respectfully requested.

f. *Chen* in view of *Taft*, and *Grot*

Claim 20 is rejected under 35 U.S.C. §103(a) as being unpatentable over *Chen* in view of *Taft*, and further in view of *Grot*. This rejection is respectfully traversed.

Applicant respectfully submits that *Chen, Taft* and *Grot* have been discussed above, and for at least the reasons discussed above, applicant respectfully submits that claim 20, which depends from claim 1, is allowable for at least the same reasons. Withdrawal of the rejection is respectfully requested.

3. New Claims

Claim 30 has been added to the application. Applicant respectfully submits that the cited references fail to disclose or suggest any of the polymers listed in claim 30. Allowance of all pending claims is respectfully requested.

4. Conclusion

Applicant invites the Examiner to contact Applicant's representative at the telephone number listed below if any issues remain in this matter, or if a discussion regarding any portion of the application is desired by the Examiner.

In the event that this paper is not timely filed within the currently set shortened statutory period, Applicant respectfully petitions for an appropriate extension of time. The fees for such extension of time may be charged to our Deposit Account No. 02-4800.

In the event that any additional fees are due with this paper, please charge
our Deposit Account No. 02-4800.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

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